

5. Urban Water Conservation

This section presents the basis and background for estimating potential water savings that may occur as a result of the No Action Alternative and savings that are anticipated to result from implementation of the Water Use Efficiency Program., or CALFED alternative. As described in Section 2, the proposed CALFED approach to urban conservation focuses on identifying and implementing new measures, as well as expanding existing measures, to improve the efficiency of local urban water use.

The values derived by CALFED and presented in this section are for a few primary purposes:

- To provide information for programmatic-level impact assessments;
- To gain a better understanding of the order-of-magnitude role urban conservation can have in statewide water management; and,
- To aid CALFED in designing the appropriate types and levels of incentive programs and assurance mechanisms.

The values are not targets, objectives, or goals. CALFED is not mandating that these or any other levels of water savings be achieved. CALFED is, however, requiring that many actions be undertaken by water suppliers and water users that will result in the implementation of more conservation and more reuse projects, but the actual savings that will result cannot be accurately estimated. Please refer to Section 2 for further description of CALFED's intended Water Use Efficiency Program.

This section presents the following information:

- Potential reductions in existing losses resulting from efficiency improvements identified as either total loss reduction or irrecoverable losses reduction (a subset of total loss available for reallocation).
- The approximate cost associated with implementing cost-effective agricultural efficiency improvements. (No determination of "who pays" is included, only an identification of the cost incurred when a cost-effective measure is implemented.)

5.1 SUMMARY OF FINDINGS

Improvements in urban water use efficiency can result in reduction of urban per-capita use and reduction of existing or projected losses associated with that use. A large percentage of these reductions can result in a water savings that can be reallocated to meet other water



in per-capita water use can result in benefits to water quality and the ecosystem, and reduced energy needed for water treatment (both potable processes and wastewater) and home water heating. Potential conservation estimates developed by CALFED are separated into two categories:

- Estimated reduction in total loss (other than the “irrecoverable loss” portion; most of this reduction is available only to provide water quality and ecosystem benefits, and potentially reduce future demand projections of a particular basin).
- Estimated reduction in irrecoverable losses (available to reallocate to other beneficial water supply uses)

Based on the detailed assumptions and data described in this section, the following estimates of cumulative savings from conservation measures are shown in Figures 5-1 and 5-2.

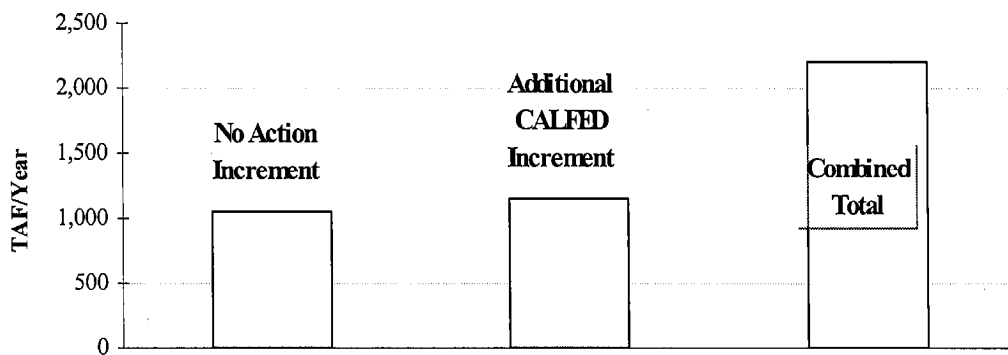


Figure 5-1. Estimated Conservation Potential of Existing Losses

These reductions can provide water quality and ecosystem benefits. The reductions do not constitute a reallocable water supply but can reduce projections of future demand.

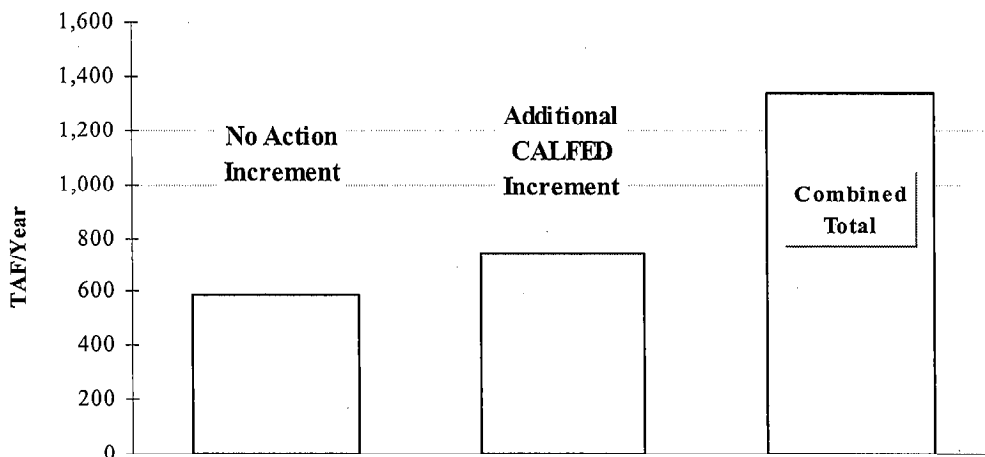


Figure 5-2. Estimated Conservation Potential of Irrecoverable

The incremental portion generated by CALFED is about half of the total projected saving water can be reallocated to other beneficial uses.

Although the conservation savings shown in these figures are sizable, it must be recognized that such savings require full implementation of conservation measures by all urban water use sectors. This effort will require increased levels of support and commitment from federal, state, and local agencies.

Costs associated with implementing conservation measures to achieve these loss reductions will vary by case. Both customer-level and water-supplier spending is necessary to obtain the anticipated levels of improvement. Water supplier expenses represent conservation support programs, including completing plans, developing customer programs, and education. A detailed discussion of conservation cost is provided toward the end of this section.

SECTION OVERVIEW

The remainder of this section provides a more detailed discussion on CALFED's assumptions used to estimate the potential reduction in per-capita water use. The section is subdivided into the following topics:

- General state-wide assumptions.
 - Specific state-wide assumptions, including the basis for projecting indoor residential; urban landscape; commercial, industrial, and institutional; and system distribution loss savings for the No Action Alternative as well as those anticipated for the CALFED solution alternative.
 - Irrecoverable losses vs. recoverable losses , including differentiation of the two types of loss and the benefits that can be derived from each.
 - Regional reduction estimates, including descriptions and assumptions for each urban region (see Section 3) and the resulting estimates of conservation from reduced indoor water use; landscape water savings; reduced commercial, industrial, and institutional use; and distribution system loss reductions.
 - Estimated cost of conservation measures, including cost information for each urban zone associated with implementing conservation measures.
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5.2 GENERAL STATE-WIDE ASSUMPTIONS

It is important to note that the estimates presented in this section were developed to help understand the potential role urban conservation could play in the larger context of state-wide water management, as well as to provide information for purposes of programmatic-level impact analysis. **These estimates are not targets or goals and should not be interpreted as such.** Neither the information nor the analysis is intended for use as planning recommendations.

The general state-wide assumptions listed below helped guide the overall analysis and development of conservation estimates. Specific assumptions are described later in this section.

- It is assumed that any decrease from existing levels of water use will be first used to offset portions of future demands resulting from increasing urban populations. Increased water conservation in the urban sector is assumed to improve the reliability of water supplies for the local entities implementing the measures. Urban water conservation is not anticipated to result in dramatic decreases in existing levels of gross demand. However, it is assumed to result in future demands being less than otherwise may have occurred.
- Urban populations are expected to increase from approximately 32.7 million to 47.5 million by 2020 (see Figure 5-4 presented later). This estimate is based on the California Department of Finance projections and is used by DWR for water demand projections. State policy requires that all state agencies use Department of Finance population data for planning, funding, and policy-making activities.
- Conservation of water that results in additional water supply is limited to the reduction of urban consumptive use and irrecoverable losses. These include reductions in landscape consumption and CII consumption, as well as reduction of losses to evaporation, saline sinks, including ocean discharge, and poor-quality perched groundwater. More detailed discussion is included later in this section.
- Conservation of water in areas where water returns to the hydrologic system in a usable form can potentially be credited with ecosystem, water quality, or energy savings benefits. Such conservation could reduce the magnitude of future demand in a region or reduce the need to develop additional water supplies. However, such savings do not result in water that can be reallocated to other uses without potential impacts on existing beneficiaries. This assumption primarily relates to daily per-capita demand that generates wastewater which, after treatment, is returned to a useable body of water. Implementation of conservation measures needs to consider existing beneficiaries that may be adversely affected by change. Such considerations include wastewater discharges that contribute to historical in-stream flows or groundwater recharge, and downstream users of treated wastewater. For example, indoor residential conservation measures to reduce diversions may adversely affect historical wastewater discharges that benefit in-stream flows in a specific waterway.
- Water that is conserved is assumed to remain in the control of the supplier for its discretionary use or reallocation. The conserved water could be used to meet growing local urban demands; offset groundwater overdraft or saline intrusion; or transfer to another benefactor, including the environment. It cannot be assumed that conserved water is automatically available for environmental uses.
- Water savings experienced by export areas importing water sources in addition to water from the Bay-Delta system will not necessarily result in the reduction of Bay-Delta exports. The reallocation of conservation savings is a local decision based on local economic and water supply conditions. For example, assume that a water agency could save 100 TAF of water annually by Conservation Measure X. This savings could reduce demands for Bay-Delta water (future or existing); reduce demands from another source, such as the Colorado River; or offset the need for other new sources. As a result of this unknown, conservation savings in regions with multiple imported supplies should **not** be assumed to result in a direct reduction of Delta exports.

5.3 SPECIFIC STATE-WIDE ASSUMPTIONS

The assumptions listed here provide the specific basis for estimating conservation potential from implementation of efficiency measures. Estimates are based on determinations of:

- Existing conditions.
- No Action Alternative conditions, which include implementation of urban BMPs to levels targeted in the existing Urban MOU, as well as some additional urban conservation measures that are similar to those projected in DWR's Bulletin 160-98 (DWR 1998).
- The CALFED solution alternative, which includes projections of future conditions that could exist as a result of implementing the Water Use Efficiency Program.

Technical assumptions are presented below for the following categories:

- Urban per-capita water use
- Residential indoor conservation
 - Existing residential indoor use
 - Projected conservation under the No Action Alternative
 - Additional conservation as a result of the CALFED Program
- Urban landscape conservation
 - Existing use
 - Projected conservation under the No Action Alternative
 - Additional conservation as a result of the CALFED Program
- Commercial, industrial, and institutional conservation
 - Existing use
 - Projected conservation under the No Action Alternative
 - Additional conservation as a result of the CALFED Program
- Water delivery system loss and leakage reduction
 - Existing system losses
 - Projected reduction in losses under the No Action Alternative
 - Additional reduction in losses as a result of the CALFED Program

5.3.1 URBAN PER-CAPITA WATER USE

Since the 1976-77 drought, a combination of mandatory requirements and voluntary agreements have directed municipal government and urban water suppliers to implement water conservation practices. Current urban water conservation programs reflect state and federal legislation that mandated changes designed to improve the efficiency of plumbing fixtures, and a voluntary MOU that set the industry standard for conservation programs.

The Urban Memorandum of Understanding

One of the primary forces behind increased urban conservation in the recent past has been the adoption of the Memorandum of Understanding Regarding Urban Water Conservation in California (Urban MOU) by many urban agencies. The Urban MOU, originally drafted in 1991, has over 200 signatories, including over 150 urban water suppliers. The Urban MOU contains 14 BMPs that are to be implemented by each urban water agency, if deemed locally cost effective and technically feasible. These BMPs are listed in Table 5-1. Implementation rates of BMPs by the urban agencies have been behind those scheduled in the Urban MOU. Continuing efforts and a recent renewed focus on BMPs, however, are anticipated to result in increased levels of implementation by the signatory agencies.

*Table 5-1. Revised Best Management Practices in the Urban MOU
(Revised September 1997)*

BMP NO.	BEST MANAGEMENT PRACTICE
1	Water survey programs for single-family residential and multi-family residential customers
2	Residential plumbing retrofit
3	System water audits, leak detection, and repair
4	Metering with commodity rates for all new connections and retrofit of existing connections
5	Large landscape conservation programs and incentives
6	High-efficiency washing machine rebate program (new)
7	Public information programs
8	School education programs
9	Conservation programs for commercial, industrial, and institutional accounts
10	Wholesale agency assistance programs (new)
11	Conservation pricing
12	Conservation coordinator (formerly BMP 14)
13	Water waste prohibition
14	Residential ultra low-flush toilet replacement program (formerly BMP 16)

Note: During 1997, the CUWCC reviewed the original BMPs. Based on input from MOU signatories, the BMPs were revised to incorporate technology and experience gained since the original BMPs were drafted.

The California Urban Water Conservation Council (CUWCC), formally established under the Urban MOU, is composed of water suppliers and public interests. The CUWCC updates the list of BMPs and revises implementation requirements. The CUWCC also disseminates information on BMPs among member agencies and reports to the SWRCB on the implementation by signatory agencies of BMPs listed in the Urban MOU. CALFED has proposed that the CUWCC certify water supplier compliance with terms of the Urban MOU.

Per-Capita Water Use

Urban water demand often is described in terms of per-capita water use. Most often, this term represents average daily water use in gallons per person per day. However, the daily use is an aggregate figure and actually represents the combination of several water-using sectors, divided by the population of the region. These sectors include:

- Residential
- Commercial, industrial, institutional
- Other, including fire flows, median landscapes, and other miscellaneous uses

For example, a per-capita demand of 200 gallons per-capita per day (gpcd) may represent a community's total residential, CII, and other uses (including fire fighting and distribution losses), divided by the area's population. Yet, the residential portion may constitute only 60% of the total (or 120 gpcd), with the remainder used by local commercial and industrial businesses, and others. Gross per-capita rates in some regions of the state reflect large industrial or commercial enterprises combined with low resident populations. For example, as shown in Table 5-2, the Colorado River Region has high per-capita water use rates because of tourist populations and a predominance of golf courses, coupled with the hot desert climate. The combination of the various water-use sectors will vary from community to community and region to region, and also can vary diurnally, weekly, monthly, and seasonally.

Table 5-2. DWR's Base and Projected Regional Urban Per-Capita Water Use (gpcd)

REGION ¹	1995 BASE URBAN DEMAND ²	2020 PROJECTED URBAN DEMAND (WITH EXPECTED CONSERVATION) ²	2020 PROJECTED URBAN DEMAND (WITHOUT CONSERVATION) ^{2,3}
Sacramento River	274	257	292
Eastside San Joaquin River	301	269	306
Tulare Lake	311	274	304
San Francisco Bay	177	169	199
Central Coast	180	164	192
South Coast	208	191	222
Colorado River	<u>578</u>	<u>522</u>	<u>594</u>
State-wide average	224	203	237

Notes:

This information is primarily for illustrative purposes and does not form the basis for all of CALFED's urban conservation estimates. CII and system distribution loss conservation do use these values.

¹ Refer to Chapter 3 for information regarding the PSAs that comprise each CALFED region.

² Values are from DWR's Bulletin 160-98 Public Review Draft, January 1998. The BMPs in the Urban MOU are the expected conservation measures implemented to project 2020 demands with conservation.

³ Per-capita use generally increases when a region's population has more money to spend. This level of demand is projected to occur if no additional conservation measures beyond those already existing in the 1995 Base occur and the regions experience a positive change in socio-economic conditions.

Generally, the per-capita water use is used to characterize and understand the overall water demands for an area, to help plan for additional demands, and to look for opportunities to reduce demand. DWR has estimated per-capita demand through use of census data, models, local information, and an array of other investigations. DWR has noted that, in the long-term, permanent water conservation programs and other factors have begun to reduce overall per-capita water use in some areas. However, other factors tend to raise per-capita rates, thus making an analysis of trends difficult. Future per-capita use rates are estimated from current rates but are further influenced by on-going conservation efforts and anticipated increases in regional economics. The latter factor can increase residential water use and landscaping demand because of inherent lifestyle changes that accompany increases in income.

DWR projects that conservation measures will reduce current per-capita use rates, although economic effects will tend to offset some conservation gains. Table 5-2 shows DWR's estimates of future per-capita water use. The DWR per-capita projections primarily illustrate urban conditions expected to occur around the state by 2020. Only a portion of the CALFED methods used to estimate potential urban conservation is based on these projections (see the more detailed discussion of methodologies later in this section). Specifically, only the estimated conservation potentials for the CII sector and distribution system losses rely on these estimates.

The values shown for 2020 have been estimated by DWR independent of the CALFED Program and are based on DWR's estimate of full implementation of the BMPs currently included in the Urban MOU. Although the actual implementation of urban BMPs is behind schedule, DWR assumes that they will be fully implemented by 2020 (originally, implementation was to occur by 2001). This level of BMP implementation is anticipated by DWR to generate an estimated 870 TAF of depletion reduction (reduction in irrecoverable losses) annually statewide by 2020 (DWR 1998). This depletion reduction is an aggregate of the conservation occurring in residential, urban landscape, CII, and "other" water use sectors and is based on assumed reductions factors only for quantifiable BMPs.

Prior to reading the next subsection, it must be understood that "Full implementation" of BMPs, as defined used in this Section is the amount of savings determined by the DWR. It is based on a limited level of implementation of quantifiable BMPs included in the Urban MOU. Not all of the BMPs are quantifiable. As such, CALFED's No Action condition and its with-project condition are premised on the assumption that greater levels of implementation will occur (i.e., more users/water suppliers are implementing measures) than assumed in DWR's estimate.

CALFED believes that the current list of BMPs in the Urban MOU is extensive and incorporates most, if not all, types of conservation measures. The key, however, is in the assumption of how extensive the implementation of BMPs is under given conditions. Actions undertaken by water suppliers and users under the CALFED with-project condition are the same as under No Action and under baseline conditions. It is not the action that changes, but the increased levels of implementation that result in greater savings at each increment. CALFED's estimates assume more users and water suppliers implement more of the BMPs, at greater levels than assumed by DWR and as included as the baseline, as is described in the next subsection.

Finally, implementation of the BMPs included in the Urban MOU are based on a cost-effectiveness test. CALFED assumes this same cost-effectiveness test will result in more measures implemented because of No Action assumptions that will likely change current cost-effectiveness calculations (see Attachment A to the Programmatic EIS/EIR for a description of No Action features). As such, there would likely be more BMPs implemented by more water suppliers by 2020 without a CALFED Bay-Delta Program than are currently anticipated by urban water suppliers today.

5.4 ESTIMATING URBAN WATER CONSERVATION POTENTIAL

The methodology used to estimate urban water conservation potential that may result from the implementation of the Water Use Efficiency Program is described here. A different methodology is applied for each of the following conservation sectors:

- Residential indoor use
- Urban landscape use
- Commercial, industrial, and institutional use
- Water distribution system loss and leakage

These estimates are developed to help understand the potential role urban conservation could play in the larger context of state-wide water management, as well as to provide information for the programmatic-level impact analysis. These estimates are **not targets** or goals and should not be interpreted as such.

CALFED acknowledges that there exists limited empirical data from which to draw to make these estimates. In this context, the water savings cannot be assumed to predict the exact outcome of future conservation efforts, either with or without the CALFED Bay-Delta Program. However, it should be noted that the Water Use Efficiency Program itself is not predicated on the actual conservation estimates. Rather these values helped CALFED design the appropriate types and levels of incentives and assurance mechanisms that are fully described in Section 2.

Furthermore, to improve upon the shortcomings of data, for the benefit of future planning exercises, the CALFED Water Use Efficiency Program includes an actions aimed at data gathering, monitoring, and focused research. This will help bring needed resources to an important part of future conservation planning and implementation. Please refer to Section 2.3.3 for more information on this CALFED action.

5.4.1 RESIDENTIAL INDOOR CONSERVATION

Residential water use includes both indoor and outdoor demands and is influenced by many factors, including climate, type and density of housing, income level, cost of water, plumbing fixtures, and the kinds of water-using appliances. Family size, metering, and water costs also influence household and per-capita water use (Pacific Institute 1995). The methodology used by CALFED to estimate indoor residential conservation potential was based on assumed average indoor water use quantities, **not** on the total per-capita use of a region.

Existing Residential Indoor Water Use

Current average indoor residential water use is estimated to vary from 65 to 85 gpcd and is estimated statewide to average 75 gpcd (DWR 1998). The range results from the dynamic factors mentioned previously but is relatively similar in any part of the state. This is primarily because typical residential indoor habits, such as showering, laundry, and toilet use, are not influenced greatly by climate or location. Rather, indoor water use is influenced by family income, family size, housing type, and other

nongeographical factors. The similarity of residential indoor water use is in contrast to the wide fluctuation in urban landscape water use, as discussed later.

In addition to DWR's "minimum month" method, used to estimate existing indoor water use, a 1998 study by WaterWiser shows that a typical family home without conservation uses 74 gpcd (WaterWiser 1998).

Assumed 2020 Baseline Residential Indoor Water Use

With current indoor use around 75 gpcd, conservation experts tend to agree that indoor use will continue to drop, especially as more of the urban BMPs are implemented (see Table 5.1). DWR, in their Bulletin 160-98, estimated 2020 indoor water use to reach 65 gpcd as a result of continued implementation of BMPs by many urban water suppliers.

CALFED has chosen to use this same 2020 baseline value to be consistent with DWR's projections contained in Bulletin 160-98. Therefore, for purposes of estimating additional conservation potential, CALFED assumes that a base level of indoor conservation of 65 gpcd has occurred. This savings is not reflected in any of the CALFED conservation estimates. Rather, the CALFED conservation projections estimate the **additional** potential to conserve water, both under No Action conditions and as a result of CALFED Water Use Efficiency Program actions.

CALFED assumes that under the No Action condition additional conservation savings will still occur, beyond the 65 gpcd assumed in the baseline. This assumes that the level of indoor water use BMPs implemented to achieve 65 gpcd is limited and that additional measures are 1) still cost-effective but have not been implemented, 2) implemented for reasons other than water savings (i.e., toilet replacement associated with remodeling or with home resale), or 3) implemented through other incentive programs, such as conservation funding in California's 1997 Proposition 204, which are or will be available even without a successful CALFED Bay-Delta Program.

Projected Conservation Under the No Action Alternative

Under the No Action Alternative, indoor residential water use is expected to decrease to 60 gpcd, based on installation of new water-efficient appliances and plumbing fixtures. Such reduced levels are already being achieved in a few California communities and are assumed to be achievable statewide.

The highest percentage of indoor use is from toilets, showers, and faucets. Plumbing code changes made in the 1970s and again in the early 1990s have required installation of only low-water-using fixtures for toilets, showers, and, in some areas, for other plumbing fixtures. Although these changes are implemented slowly in existing structures as fixtures are replaced, change-out of many plumbing fixtures is anticipated by 2020 regardless of a CALFED solution. Because low-water-use fixtures are installed in new housing, further upgrades would not be necessary. Furthermore, replacement of existing high-water-using appliances (such as dishwashers and washing machines) with new, more efficient appliances also will help reduce the per-capita water use to achieve the anticipated levels.

For purposes of estimating the No Action Alternative conservation potential, CALFED assumed a value of 60 gpcd. The difference between this value and the 2020 baseline value of 65 gpcd (65 minus 60 equals 5) is multiplied by the 2020 projected population and converted to acre-feet per year. Population projections are shown in Figure 5-4.